REMARKS

Applicant respectfully requests consideration of the present application, as preliminarily amended.

The following documents accompany this Preliminary Amendment:

1) Petition to Correct the Filing Date; and

2) Request for Correction of Filing Receipt.

Summary of Office Action

Claims 20-35 were noted as pending.

Claims 20-35 were rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 5,359,236 of Giordano ("Giordano") in view of U.S. Patent No. 5,287,292 of Kenny, et al. ("Kenny").

Pending Claims

Applicant respectfully submits that claims 20-36 were pending at the time the present continuation application was filed. The original application (08/124,980) was filed with claims 1-36. Divisional application number 08/401,473 was filed with a preliminary amendment to cancel claims 1-19 of the prior application. Thus claims 20-36 were pending in application number 08/401,473 at the time the present continuation application was filed. As stated above, however, claims 20-36 have been canceled. As described below, claims 37-60 are currently pending.

Summary of Amendments

The specification has been amended at page 23, lines 16-17. Applicant respectfully submits that the specification was amended to properly refer to the temperature of the integrated circuit instead of the supply voltage. Applicant respectfully submits that the amendment to the specification does not add new matter.

Claims 37-60 have been added. Applicant respectfully submits that support for new claims 37-60 is found in the specification and in claims 1-36 as originally filed. Applicant respectfully submits that new claims 37-60 do not add new matter.

Applicant respectfully submits the following claim correspondence between applicant's claims and the claims of U.S. Patent No. 5,451,892 of Bailey ("Bailey"):

Claim 59 corresponds substantially to claim 1 of Bailey.

Claim 59 corresponds substantially to claim 11 of Bailey.

Claims 54 corresponds substantially to claim 18 of Bailey.

Claim 55 corresponds substantially to claim 19 of Bailey.

Claim 58 corresponds substantially to claim 20 of Bailey.

Response to 35 U.S.C. § 103 rejections

Claims 20-35 were rejected under 35 U.S.C. § 103 as being unpatentable over Giordano in view of Kenny.

As stated above, applicant has canceled claims 20-36. Applicant respectfully submits that new claims 37-60 are patentable in view of the references cited by the Examiner. In particular, applicant respectfully submits that none of Kenny and Giordano, alone or combined, teaches or discloses a structure of a microprocessor, wherein the microprocessor comprises a programmable thermal sensor.

Kenny includes a disclosure of a heat regulator for integrated circuits. The temperature of the integrated circuit is measured directly with a temperature monitor or indirectly estimated from a measure of the activity of the integrated circuit. (Kenny, col. 1, line 51 thru col. 2, line 2).

Applicant respectfully submits that the direct measuring temperature monitor taught by Kenny is *external* to the microprocessor. (Kenny, col. 9, lines 38-52). Thus the temperature monitor as taught by Kenny does not form part of the structure of the microprocessor. Furthermore, Kenny does not disclose a programmable temperature monitor. Referring to Figure 5, the temperature is measured by using a voltage divider including a temperature dependent resistor (501). The voltage divider provides a signal 505 to a power use regulator 502. When signal 505 reaches a trigger value, the power use regulator activates (Kenny, col., 9, lines 40-45). *Applicant submits that Kenny does not teach or disclose a programmable trigger level such that the thermal monitor is programmable.*

With respect to the "indirect method" of measuring temperature, applicant points out that the indirect method does not actually measure temperature. Instead, counters are used to accumulate a count corresponding to the length of time that the CPU is operating at various frequencies. (Kenny, col. 5, line 42 thru col. 6, line 22). The counter increments when the CPU is operating at one frequency and decrements when the CPU is operating at another frequency. If the counter reaches a threshold value, a regulating signal is generated to force the CPU to a slower clock speed. (Kenny, col. 5, lines 58 thru col. 6, line 5). *Thus applicant respectfully submits that the circuitry associated with the indirect method is not a programmable thermal sensor nor is it incorporated into the microprocessor.*

Giordano includes a disclosure of a thermal sensor circuit. The thermal sensor circuit of Giordano generates a signal when a predetermined threshold temperature is reached. In particular, Giordano discloses a means of varying a temperature sensitive VBE to vary the rate of change of conduction of a transistor for small temperature variations about a critical temperature. (Giordano, col. 5, line 33 thru col. 6, line 4). Applicant submits that the critical temperature is established at the time of manufacture through the characteristics of Q1 and R2 (see col. 1, line 26 thru col. 2, line 2 referring to Fig. 1A). *Applicant thus respectfully submits that the thermal sensor circuit of Giordano is not programmable.*

In contrast, claim 37 includes the language:

> 37. *A microprocessor comprising:*
> a register storing a register value corresponding to a threshold temperature;
> *a programmable thermal sensor* receiving the register value, wherein the programmable thermal sensor generates a first interrupt signal if a microprocessor temperature exceeds the threshold temperature corresponding to the register value;
> clock circuitry for providing a clock signal for the microprocessor; and
> a processor unit coupled to the clock circuitry, wherein the processor unit executes instructions to vary the frequency of the clock signal in response to the first interrupt signal.

(Claim 37)(*emphasis added*).

Similarly, claim 43 includes the language:

> 43. A computer system comprising:
> an active cooling device;
> *a microprocessor comprising:*

a register storing a register value corresponding to a threshold temperature;

a programmable thermal sensor receiving the register value, wherein the programmable thermal sensor generates a first interrupt signal if a microprocessor temperature exceeds the threshold temperature, wherein the active cooling device is activated in response to the interrupt signal.

(Claim 43)(*emphasis added*).

Because none of the cited references teach or disclose a microprocessor comprising a programmable thermal sensor, applicant respectfully submits that claims 37 and 43 are patentable under 35 U.S.C. § 103 in view of the references cited by the Examiner.

Furthermore, none of Kenny and Giordano teaches or discloses a microprocessor comprising a processor unit executing instructions to vary a frequency of the microprocessor clock signal in response to the interrupt generated by the programmable thermal sensor.

To the contrary, Giordano merely teaches nonprogrammable circuitry for detecting when a critical temperature has been reached. Kenny teaches circuitry external to the microprocessor for regulating the temperature of an integrated circuit. Applicant submits that none of Giordano and Kenny teaches or discloses a microprocessor comprising a processor unit that executes instructions to vary a microprocessor clock frequency in response to an interrupt signal.

In contrast, claim 37 includes the language:

37. *A microprocessor comprising:*

a register storing a register value corresponding to a threshold temperature;

a programmable thermal sensor receiving the register value, wherein the programmable thermal sensor generates a first interrupt signal if a microprocessor temperature exceeds the threshold temperature corresponding to the register value;

clock circuitry for providing a clock signal for the microprocessor; and

a processor unit coupled to the clock circuitry, wherein the processor unit executes instructions to vary the frequency of the clock signal in response to the first interrupt signal.

(Claim 37)(*emphasis added*).

For the reasons presented above, applicant respectfully submits that claims 37 and 43 are patentable under 35 U.S.C. § 103 in view of the references cited by the Examiner.

Given that claims 38-42 depend from claim 37 and claims 44-48 depend from claim 43, applicant respectfully submits that claims 38-42 and 44-48 are likewise patentable in view of the references cited by the Examiner.

With respect to claims 49-53, applicant respectfully submits that none of the cited references teaches or discloses a microprocessor performing the steps of 1) generating a temperature signal within the microprocessor; and 2) comparing the temperature signal with a first threshold level within the microprocessor.

In contrast, claims 49 and 51 includes the language:

> 49. A method of controlling a temperature of a microprocessor, wherein *the microprocessor performs the steps of:*
> *a) generating a temperature signal within the microprocessor indicative of the temperature of the microprocessor;*
> *b) comparing the temperature signal with a first threshold temperature level within the microprocessor;*
> • • •

(Claim 49)(*emphasis added*).

> 51. A method of controlling a temperature of a microprocessor, wherein *the microprocessor performs the steps of:*
> a) *generating a temperature signal within the microprocessor* corresponding to the temperature of the microprocessor;
> b) *comparing the temperature signal with a first threshold temperature level within the microprocessor;*
> • • •

(Claim 51)(*emphasis added*).

Thus applicant respectfully submits that claims 49-53 are patentable under 35 U.S.C. § 103 in view of the references cited by the Examiner.

With respect to claims 54-58, applicant respectfully submits that none of the references alone or combined teaches or discloses controlling a frequency of a clock signal that drives a microprocessor by performing steps including the steps of 1) generating a temperature signal corresponding to a temperature of the microprocessor, 2) generating a first threshold signal if the temperature signal indicates that the microprocessor temperature exceeds a first threshold temperature, and 3) generating a second threshold signal if the temperature signal indicates that the microprocessor temperature exceeds a second threshold temperature.

In contrast, claim 54 includes the language:

54. A method of controlling a frequency of a clock signal which drives a microprocessor, comprising the steps of:

a) generating a temperature signal corresponding to a temperature of the microprocessor;

b) generating a first threshold signal if the temperature signal indicates that the microprocessor temperature exceeds a first threshold temperature;

c) generating a second threshold signal if the temperature signal indicates that the microprocessor temperature exceeds a second threshold temperature; and

• • •

(Claim 54)(*emphasis added*).

Applicant thus respectfully submits that claim 54 is patentable under 35 U.S.C. § 103 in view of the cited references.

Given that claims 55-58 depend from claim 54, applicant respectfully submits that claims 55-58 are likewise patentable under 35 U.S.C. § 103 in view of the cited references.

With respect to claims 59-60, applicant respectfully submits that none of the cited references teaches or discloses a microprocessor comprising 1) a thermal sensor generating a temperature signal corresponding to a temperature of the microprocessor; 2) logic circuitry coupled to the thermal sensor, the logic circuitry generating a first signal if the temperature signal exceeds a first threshold level and a second signal if the temperature signal exceeds a second threshold level; and 3) means for varying the associated frequency of the clock signal in response to at least one of the first and second signals.

In contrast, claim 59 includes the language:

A microprocessor comprising:

a processor unit;

a clock circuit providing a clock signal to the processor unit, the clock signal having an associated frequency;

a thermal sensor generating a temperature signal corresponding to a temperature of the microprocessor;

logic circuitry coupled to the thermal sensor, the logic circuitry generating a first signal if the temperature signal exceeds a first threshold level and a second signal if the temperature signal exceeds a second threshold level; and

means for varying the associated frequency of the clock signal in response to at least one of the first and second signals.

(Claim 57)(*emphasis added*).

Thus applicant respectfully submits that claim 59 is patentable under 35 U.S.C. § 103 in view of the references cited by the Examiner.

Given that claim 60 depends from claim 59, applicant respectfully submits that claim 60 is likewise patentable under 35 U.S.C. § 103 in view of the references cited by the Examiner.

Conclusion

Applicant respectfully submits that in view of the amendments and arguments set forth herein, the applicable rejections and objections have been overcome. Accordingly, claims 37-60 should be found to be in condition for allowance.

If a telephone conversation would facilitate resolving any outstanding issues, the Examiner is invited to contact the undersigned at (503) 684-6200.

If there are any additional charges associated with this communication, please charge Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN

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